

813367  
1058

**Representative  
of Every Interest**

# The Citrus Industry

**Representing  
No Special Interest**

**CITRUS INSECT CONTROL  
FOR FALL 1959 . . .**

**Fruit Growing Is A Business—  
And Should Be Treated  
As Such**

**72nd Horticultural Society  
Meeting Set For Oct. 27-29**

**Mechanization Of Citrus  
Fruit Picking**

**Standards For Lemon Juice  
Manufactured Announced**

**Refrigerated Warehouse  
Practices**

**Floridians Will Go To Europe  
To Seek Improved Citrus  
Market**

**Florida Citrus Growers  
Administrative and Shippers  
Advisory Committee  
Members Named**



**ERLE L. WIRT, JR.**  
Second Generation Citrus Grower

Single Copy ..... 15 Cents  
Subscription  
\$1.00 Per Year In Continental U. S.  
\$2.50 Per Year Outside



## **"ORTHO assures top market-quality grapefruit"**

"We have had excellent control of scale and mites since we've been using ORTHO products," says Jim Dickinson, Production Manager, Wardlow Bros., Frostproof, Fla. (pictured above on left of ORTHO Fieldman Joe Murphy).  
 "ORTHO assures us of top quality grapefruit for the fresh fruit market."

### **Leading Florida Citrus Growers acclaim ORTHO Field Service and products. Here's why:**

When you buy ORTHO products, all the personal, on-your-ground technical advice and services of your ORTHO Fieldman are provided gladly and without any extra charge. Too, with ORTHO, you're associated with the company that first developed highly refined petroleum oil sprays in the form of new type emulsions and ready-mixes. This scientific research and technical experience have made ORTHO Field Service and products the choice of Florida citrus growers for over 34 years.



**Helping the World Grow Better**

California Spray-Chemical Corp.  
 A subsidiary of California Chemical Co.  
 P. O. Box 7067, Orlando, Florida

T. M. REG. U. S. PAT. OFF. : ORTHO

### **Contact your nearest ORTHO Fieldman today:**

Lake Alfred: J. S. Murphy, Jr. • Lakeland: Jean E. Mabry • Leesburg: Charles Ashley  
 Orlando: Cliff Sutton • Orlando: John Nowell • Deland: Randall Williams • Plant City: Webster B. Carson

# Citrus Insect Control For Fall 1959



R. B. Johnson

R. B. Johnson  
W. L. Thompson  
W. A. Simanton



W. L. Thompson

Florida Citrus  
Experiment Station  
Lake Alfred,  
Florida



W. A. Simanton

Rust mite, red scale and black scale have been the most important citrus pests this summer. Melanose has been much more abundant than usual on both leaves and fruit since spring due to the abundant rains. The unusually high melanose infection of leaves weakened them and undoubtedly is a factor in the excessive leaf drop observed in some groves.

Too much water in the root zone has weakened trees in groves that have not had the problem for many years. Wilting, leaf drop and root kill is now evident in several coastal locations and in a few interior groves.

Rust mite populations increased to a very high level in July and will continue high through August. Although a decline will prevail in September, subsequent increase is expected to keep rust mites abundant in October and November. During the fall months rust mite infestations tend to be higher on fruit than on leaves and this point should be considered when checking groves.

Red scale, which has exhibited above average populations since last October, will continue to be a major problem in many groves this fall. Infestations of this pest are expected to vary greatly from grove to grove.

Black scale populations were the highest on record this summer and reached a peak in July. Where high populations were present sooty mold will be abundant due to honeydew excreted by the scales. Infestations generally will decline during the next two months. Young scales of the second generation will be seen in moderate numbers on leaves and stems this fall.

Chaff scale is expected to be more

abundant than usual this year and groves should be watched for injurious populations which start to build up in September.

In previous years, purple scale has been a threat to a majority of groves throughout the year. This year populations are so low, due largely to parasite activity, that little trouble is expected.

There are indications that purple mite will be less abundant than usual

or where coverage or timing of the zineb spray was inadequate. Regardless of the cause, rust mite should not be allowed to increase to large numbers even though control may require an extra application. This year Florida red scale, black scale, chaff scale and, to a lesser extent, purple scale, may require control in August. If this is the case, scales and rust mite may be controlled with the same spray. If, on the other hand, rust

SCALE AND MITE ACTIVITY BY DISTRICTS \*

District	Purple Scale	Red Scale	Purple Mite	Rust Mite on leaves	Black Scale
West Coast	2.89	3.22	1.11	3.11	5.12
Indian River	1.09	4.08	1.54	1.89	4.86
Upper East Coast	2.00	.50	2.00	3.50	4.00
Gainesville	0	2.00	1.00	0	0
Orlando	1.92	3.00	.91	1.10	2.32
Brooksville	1.08	3.61	.31	2.08	3.79
Ridge	3.70	4.18	2.32	2.88	5.13
Bartow	3.13	4.48	.13	2.57	3.38
State Average	2.98	3.78	1.27	2.27	4.18
Last Year	4.97	3.16	2.11	1.84	2.53

\* Second week in July. Activity is computed from populations, amount of hatching of scales, and number of groves with increasing or decreasing infestations. Activity is considered high if above 4.0 for purple scale, 3.0 for red scale, and 1.5 for mites.

during the remainder of the year. On the other hand, Texas citrus mite can be expected to be more prevalent. Frequent rains have helped to retard the purple mite problem during the first half of the year, but a dry fall could create trouble with this pest.

## SPRAY PROGRAM

There are three or four sprays of primary importance in any complete spray program. These should be applied after bloom, in the summer, during the fall, and if necessary, in the dormant period. The fall spray is primarily for mite control and should be applied when needed from September through December. August sprays are too early for maximum control of purple mite, Texas citrus mite, and citrus rust mite, but may be necessary for other purposes. Rust mite, for example, is often an August problem where sulfur instead of zineb was used in the previous application

mite alone is the problem, a sulfur dust or similar treatment is economical and should give control until time for the fall miticide application. If neither rust mite nor scales are an immediate problem, the next spray should be delayed until needed for mite control.

**Scale Control:** Scalicide applications should be at a minimum during late summer and early fall. It is likely, however, that one or more species of scale will be a problem in some groves. Particular attention should be paid to red scale and chaff scale, especially in groves that have not been sprayed since June or earlier.

Red scale has been more numerous this year than usual and is most likely to be a problem in groves sprayed early in the summer or where there was a heavy infestation at the time the scalcide was applied. Even though the lower areas of large trees may be comparatively free of scale,

\* Written July 24, 1959. Reports of surveys by Harold Holtsberg, Fort Pierce; J. W. Davis, Tavares; K. G. Townsend, Tampa; T. B. Hallam, Avon Park; and L. B. Anderson, Jr., Lake Alfred.

the tops should be checked because coverage and scale control is usually not as thorough in tree tops.

Chaff scale increases rapidly from August through October and causes green spots on fruit that will not de-green in the coloring room. Inspect tangerines and early varieties of oranges carefully because young chaff scale are rather inconspicuous on green fruit. If fruit is found to be infested with either chaff or purple scale, the grove should be sprayed at once to prevent further infestation and more reduction in grade.

This year black scale is a problem in some groves and is an indirect cause of sooty mold. Where control is necessary, apply the scalecide by the middle of August or before the scale is mature, because the older stages are difficult to kill. The sooner the scale is killed, the less likelihood there is of excess sooty mold. Any of the scalecides used for purple and red scale control are effective if applied when the scales are in the young stages.

One-fourth pound of technical parathion or 1 to 1.25 pounds of technical malathion per 100 gallons are the preferred scalecides for August or later applications. Neither of these materials depress soluble solids in fruit juice, or are as likely to cause as much leaf drop as oil emulsion.

Sprays containing oil are not desirable later than July. Oil is most likely to depress soluble solids and retard degreening of fruit when applied in August, September, or October. Furthermore, if oil was applied at any time during the summer, a second application made from August through October will have a greater adverse effect on solids and color than a single application. Under no condition should tangerines be sprayed with oil after July, because it will prevent the development of good color. Trees sprayed with oil in October or later are more susceptible to cold injury and sometimes do not put out the normal amount of bloom the next spring.

**Mite Control:** The aim of the fall mite spray, applied from September to December, should be to control citrus rust mite, purple mite, and Texas citrus mite until after bloom the following spring. Although such an interval of control cannot be guaranteed, there are ways a grower can enhance his chances of such success. First, he should select the miticide or combination of miticides most suited to the problems; second, he should delay the application as long as possible, but not after more than 20 percent of the fruit or foliage is

infested; and third, he should apply the spray thoroughly enough to cover all fruit, leaves, and green twigs.

The selection of the miticide or combination of miticides should be based partly on previous treatment and partly on the species of mites that are present. If sulfur was used in the summer, rust mite is likely to be more numerous, more injurious and more difficult to control in the fall than if zineb, or Chlorobenzilate at applied. In this case, the most effective rust mite miticide, zineb, should be used at 0.5 to 1.0 pound per 100 gallons of spray. Chlorobenzilate at 0.5 to 1.0 pound of the powder or 0.5 to 1.0 pint of the liquid formulation may be substituted for zineb. If purple mite and Texas citrus mite control is also desired, the most effective purple mite miticide, Tedion, should be included in the spray at 0.5 pound per 100 gallons. Tedion, however, has not as yet been approved for use on fruit and should be confined to non-bearing trees or to groves where the fruit has been picked. Trithion at 1.0 pound of the powder or 0.5 pint of the liquid formulation or 1.0 to 1.5 pound of Kelthane, although effective for a shorter period, may be substituted for Tedion.

If zineb or Chlorobenzilate was used in the summer spray instead of sulfur, zineb is not so essential in the fall. Excellent control of rust mite may be obtained with Chlorobenzilate, Trithion, or 10 pounds of wettable sulfur. Trithion will also control purple and Texas citrus mites, but Tedion, Kelthane, Systox, or DN Dry Mix No. 1 should be included if sulfur or Chlorobenzilate is used against rust mite.

Any of the above miticides or combinations may be used with parathion or malathion for combined control of mites and scales.

The time of application is important. The later in the fall a spray is applied, the greater the chances of control lasting until after bloom. Although an early spray may last just as long as a late spray, it may not last until after bloom the following spring because of the greater interval between time of application and post-bloom. On the other hand, the effectiveness of any spray depends as much on the completeness of initial kill as it does on residual action. In general, the higher the mite population at the time of application, the poorer the initial kill and the shorter the period of control. Sprays should not be delayed too long. A good policy is to spray when about 20 percent of the fruit or leaves are infested. This means that sprays to con-

trol rust mite, purple mite and Texas citrus mite should be applied when about 20 percent of the fruit or leaves are infested with one or more of these species of mites. This recommendation applies to the interval from late September through December, but it does not necessarily apply to August. August applications are usually too early to give control until post-bloom and should be considered as extra applications to give a short period of control until the regular fall spray can be applied. Sulfur dust for rust mite, Trithion dust for rust mite, purple mite, and Texas citrus mite, and aerial applications of Trithion, Systox, or TEPP for purple and Texas citrus mites are suitable for this purpose.

With the exception of sulfur, none of the miticides used on citrus have any appreciable fumigating action. All of them kill by contact with the mite. Miticides that are not applied thoroughly enough to contact the mite are of no value. Since mites occur on leaves, fruit and green twigs it is essential that sprays be applied thoroughly enough to cover all of these areas. It is the only way to prevent poor results or out and out failure.

Details of spray schedules and the various materials used will be found in the "Better Fruit Program" and this should be consulted to determine which materials may or may not be combined. For further information, consult the Citrus Experiment Station at Lake Alfred or Fort Pierce.

### J. E. BALDWIN NAMED VICE PRESIDENT OF SNIVELY GROVES

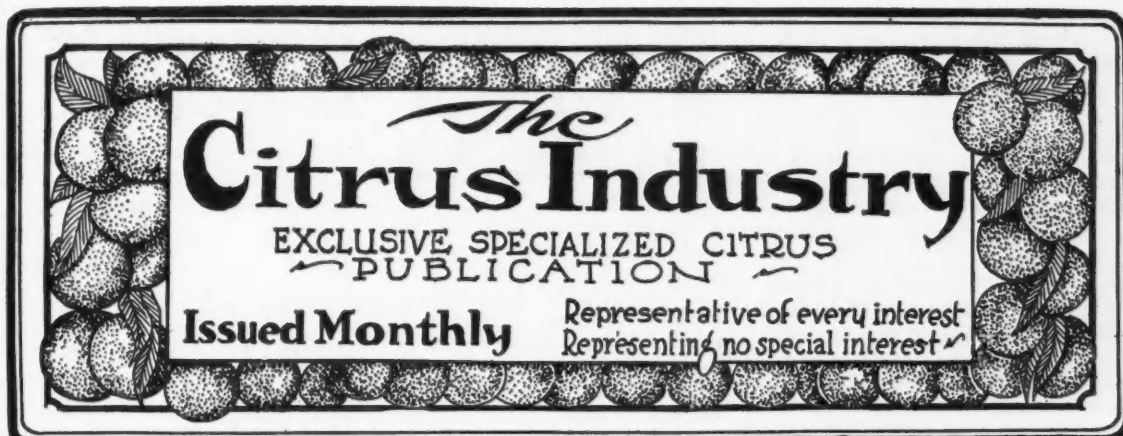
J. E. Baldwin, formerly sales manager of packers' cans in the Eastern Division of Continental Can Company, has been appointed a vice president of Snively Groves, Inc., is was announced by John A. Snively, Jr., president.

Mr. Baldwin's duties will primarily be in sales capacities and as assistant to the president, with his office located at the firm's headquarters in Winter Haven, Florida. He had been connected with Continental Can for the past 40 years.

Snively Groves is the grower, shipper and canner of Cypress Gardens brand oranges, grapefruit and tangerines. The firm's citrus line includes juices, sections, frozen concentrate.

Spuds Johnson says a secret usually is not worth keeping or too good to keep.





Publication office at Bartow, Florida. Entered as second class matter February 16, 1920, at the post office at Tampa, Florida, under act of March 3, 1879. Entered as second class matter June 19, 1933, at the post office at Bartow, Florida, under act of March 3, 1879.

## Fruit Growing Is A Business --- And Should Be Treated As Such

... By ...

Prices paid by the United States farmers have increased about  $2\frac{1}{2}$  times since 1935-39. Wage rates have increased 4 times and are still climbing. Prices of power and equipment have more than doubled. Prices of fertilizer, however, have leveled off at about 50 percent above those of 1935-39.

Under these conditions it is highly important that the citrus grower keep accurate and complete cost of production record. It is also important that the grower utilize the information from these accounts. By so doing, these accounts will in turn "keep" the grower. Citrus fruit production is a business and any business needs accurate records kept on it.

Good management is the key to profits. "There is more in the man than in the land," is true in citrus production. Good management is more important than ever before as:

(1) Citrus growing takes more capital now than formerly. (2) There has been and there still is a rapid increase in technological development. (3) Economic conditions are changing rapidly. (4) Earnings gap between good and poor managers is widening. Good records greatly assist and facilitate good management.

Complete records of expenses and receipts should be kept of each grove unit. A necessary part of these records is a tree chart, giving setting dates by variety of each tree together with tree condition. Records should be kept of yield, returns,



ZACH SAVAGE  
AGRICULTURAL ECONOMIST  
AGRICULTURAL EXPERIMENT  
STATION

kind and amount of fertilizer applied and/or used in sprays and kind, amounts and time of application of spray and dust for insect and disease control.

Good business management requires a lot of pencil and paper work. Profitable decisions are more likely to result from well conceived planning on paper, backed up by sound facts and figures, than from

the too common, haphazard, "of-the-cuff" method.

The grove managers who refuse to develop an economic approach to their grove business problems will also find it increasingly difficult to gain or maintain grove profits. This is true regardless of the size of the grove unit.

There is money to be made in citrus fruit production, both in good times and in poor times. Growers who apply principles of sound business management will be the ones who make it. Those who do not will find they are no longer a part of commercial citrus production.

Approximately 80 percent of the cash cost of producing citrus fruit is represented in labor, power and equipment and fertilizer materials. About 50 percent of such costs are for labor, power and equipment. The proportion expended for these last named items has increased in recent seasons. On the other hand, the proportion expended for fertilizer materials has decreased. Adequate records that are carefully analyzed on each grove are necessary for maximum profits. Adequate fertilizers are very necessary. However, too much fertilizer in total or excessive amounts of some elements do not result in economical fruit production.

To irrigate successfully the proper amount of water should be applied at the proper time. To determine this, complete records are necessary to arrive at the proper

amount of water and when to apply for each grove unit. Soil, elevation, topography, variety, rootstock, setting distances, age of trees and other factors affect irrigation practices. Any increase in cover crops, insects or diseases brought about by irrigation should be considered and handled adequately.

Technological changes are taking place in citrus production as well as in agriculture generally. Change is the law of progress. The challenge which faces us is to direct the change along constructive changes. With proper direction, these changes will result in increased production and distribution efficiency, added control of quality, less risk of pride and income variation to the growers, more rapid adaptation to scientific and technological innovations, and increased profits to those growers who are able to grow along with these changes.

Adequate grove records, properly kept and analyzed will assist very materially in making the needed changes on the production end. Those who manage our citrus production, processing, and distribution firms are challenged to give intelligent direction to the changes ahead so that our citrus industry will function even better than now.

Some facets of citrus production adjustments

1. Capital requirements will grow, in total, per grove and capital requirements have grown to the extent that it is becoming increasingly difficult for an individual, during his productive years, to accumulate a sufficient amount to finance an economically sized operating unit. This will become increasingly true in the decades ahead. As the science of fruit production continues to advance, it is inevitable that the business units will get bigger and bigger with still larger amounts of capital required. This trend cannot be stopped. Nor should it be. We must adjust our institutions and programs to it, so as to capture such benefits as will flow from it. Many growers have been taking advantage of larger unit operations and equipment ownership through cooperative and other caretaking organizations doing much of the caretaking work.

2. The trend toward larger and fewer citrus production units will continue. Machines will displace some of the man labor in groves, thus requiring higher investment in equipment as well as in grove. A

## 72nd Horticultural Society Meeting Set For October 27-29

The 72nd Annual Meeting of the Florida State Horticultural Society will be held at the Hotel Everglades in Miami October 27 thru 29. The meetings, starting at 2 PM on the 27th will include a general session for the entire membership and 3 sessions for each of the 5 horticultural sections. The banquet will be held Wednesday evening, Oct. 28.

S. John Lynch of the University of Miami will preside as President of the Society. The Vice-Presidents who will serve as sectional chairmen are as follows: Citrus: Dan E. Richardson of Vero Beach; Krome: Dr. T. W. Young of Vero Beach; Vegetable: William U. Huter of Plant City; Ornamental: Philip J. Fleming of Bradenton, and Processing: W. Clifford Scott of Winter Haven.

Other officers assisting with the Annual Meeting are Secretary and Program Chairman: Dr. Ernest L. Spencer of Bradenton; Treasurer Registration Chairman: R. R. Reed of Tampa; Publications Secretary: Ralph P. Thompson of Winter Haven, and Editing Secretary: W. Lacy Tait of Winter Haven. Dr. F. Gray Butcher of South Miami is General Chairman in charge of local arrangements.

son upon inheriting a large grove may find it advantageous to go into some kind of financial arrangement with a third party for some of the necessary capital for the large operation. Managerial capacity is even more difficult to pass from father to son than is accumulated capital.

## Lyons Fertilizer Elects Officers

W. L. Waring, Jr., was elevated to the position of Chairman of the Board, and chief executive officer of the Lyons Fertilizer Company at the annual meeting of the Board of Directors held in the company's office in Tampa Tuesday, July 21st.

Other officers named were W. F. McLain, nephew of Waring, who was elected president of the company; E. J. Charette, was named executive vice president and general manager; J. C. Wolfe, vice president and sales manager; P. W. Pervost, secretary and treasurer, and Robert Bertram, assistant secretary and treasurer.

The Lyons Fertilizer Company was started in 1924, and has grown constantly until today it ranks among the leading fertilizer companies of the state.

In making his annual report Waring stated that the fiscal year just closing was one of the most successful in the company's existence. Plans for further development were also announced.

3. Management is now the critical factor in successful grove operation. And this means a highly specialized kind of management where records are extremely valuable.

4. Negotiated pricing will tend to displace competitive pricemaking structure. This has already taken place in fruits and vegetables grown under contract for specialized processing. We probably will see the development of price bargaining agencies among growers, who will attempt to bargain growing terms and prices before the fruit is produced. Here again, production under such conditions will require advanced production techniques and efficient management that includes adequate records and financing.

### A STABLE INDUSTRY LIKE "CITRUS" MAKES FOR SOUNDNESS IN OUR COMMUNITY

*A Bank built by "citrus" stands ready to assist the successful grower*

Hours: 9:00 A.M. to 1:00 P.M. — 5:00 P.M. to 7:00 P.M., Fridays  
Closed Saturdays — Phone 3-6411



LAKE WALES STATE BANK

With Trust Department  
LAKE WALES, FLORIDA

Conservative

Dependable

Progressive

# Mechanization Of Citrus Fruit Picking<sup>1</sup>

Picking citrus is an onerous and time consuming task. Florida Citrus Mutual's Statistical Report (3) indicates that 138,000,000 boxes of citrus were harvested in Florida in the 1956-57 season. The cost of picking<sup>2</sup> this crop, at 29 cents per box, was approximately \$40,000,000 (12). Of this total 63 percent (\$25,000,000) was for picking labor.

Cost is not the only factor to take into consideration. The labor situation is creating difficulties of ever increasing magnitude. Larger production and shortage of housing facilities help to aggravate the situation (1).

A review of literature shows that work has been done to develop improved methods for handling Florida citrus after it is picked (8, 10), but little has been done to mechanize the actual picking operation.

In 1957 work was initiated at the Florida Citrus Experiment Station to develop improved methods and equipment for harvesting citrus. This paper presents the results of the initial phase of this project.

## Ideas Proposed Or Tried

Several methods were considered and some have already been tried. Each one will be discussed briefly:

### Elimination of the Picking Bag.

The method of throwing the picked fruit from its location in the tree into a movable catch frame placed in the center of four adjacent trees was tried at the Station (Fig. 2). This was intended to relieve the picker from the weight of the fruit on his shoulder and eliminate the time required for dumping the bag into the boxes. A preliminary test indicated that the productivity of the picker was not increased. This was attributed to the awkward position from which the picker disposed of the individual fruit and the wasted motions in aiming at the catch frame. However, after becoming accustomed to this odd working position the picker's efficiency might increase. Only through an extensive field test can this equipment be fully evaluated. The main advan-

P. J. JUTRAS AND

G. E. COPPOCK

FLORIDA CITRUS EXPERIMENT

STATION, LAKE ALFRED

AT MEETING FLORIDA STATE

HORTICULTURAL SOCIETY

CLEARWATER, OCT. 29-31, 1958

tage in its favor is the low investment cost.

**Continuous Removal of the Fruit from the Bag and Elimination of Ladder Moving.**—Here, one end of a flexible tube (normally retracted) was attached to the open bottom of a picking bag. The other end was attached to the base of a ladder mounted on a "goat" truck so that fruit placed in the bag by the picker dropped down the tube into a dump-type container located on the "goat." The base of the ladder was attached to a swivel mechanism that could be locked in place once a desired position in the tree was established. Three of these units were placed on either side of the "goat" (Fig. 3).

It was apparent during tests of this equipment that the picking rate was not increased. A more uniform tree shape would greatly increase the possibilities of this method (4). The chutes that lowered the fruit hindered the picker and made it difficult for him to reach all the fruit. The ladders caught on the trees and it was difficult to move them to a new location.

**Continuous Removal of the Fruit from the Bag and Elimination of Ladder.**—This entails some type of moveable platform on which the pickers stand. One level may be used for small trees, and two or more for taller trees.

Here again, it is apparent that a new tree structure is necessary before field trials are justified. A hedgerow, consisting of trees planted closely in the row and hedged back sufficiently enough to allow the pickers to reach the center of the tree, is contemplated. The height of the hedge would be controlled by topping to increase picking efficiency (Fig. 1). This type of tree structure and its effect on yield, fruit quality, and cost of production has not yet been investigated.

## Elimination of Bag and Ladder.

—Different types of commercial machines were tested.

The "Steel Squirrel" is a self-propelled unit equipped with a fork-lift type mechanism to move the operator both vertically and around the tree. All the controls are located inside the cage. Due to the dense growth characteristics of citrus trees, it was impossible either to move the machine to the inside of the tree to pick the fruit, or to pick the top fruit without damaging the tree.

The "Travel Tower" (Fig. 4) resembles the "Steel Squirrel" in operation, except the operator is located on the end of a boom that is moveable vertically and laterally. Most of the fruit could be reached when picking from trees up to 20 feet in height, but maneuverability was questionable in Florida sand. A short field test with oranges indicated that an increase in picking rate of 40 to 50 percent could be expected under favorable conditions, provided some type of automatic fruit disposal system could be devised. This percent is in line with Zuroske's findings (14).

**Elimination of the Picker.**—This approach implies replacing the human hand by a device that is more efficient. Two lines of approach have been considered: "combing" the fruit off and shaking it off. It was felt that combing would be too injurious to the trees and the idea was not pursued any further.

Tree shaking has been used as a method of picking with prunes, pecans, peaches, pears, walnuts and olives (2, 5, 6, 11), but little is known of the possibility of using this method for picking Florida citrus.

Preliminary tests at the Citrus Experiment Station with a cable-type tractor shaker have shown promise with grapefruit. Oranges, however, are more difficult to remove. Lamouria et al. (5) have found that the boom-type shaker provides the highest percent fruit removal and lowest man-hour labor requirement when harvesting olives. This type of shaker has yet to be valuated with citrus.

If some type of chemical was found that would loosen the fruit

<sup>1</sup>Florida Agricultural Experiment Station Journal Series, No. 833.

<sup>2</sup>Cooperative research by the Florida Citrus Experiment Station and the Florida Citrus Commission.

<sup>3</sup>"Picking" here includes all costs allocated by Spurlock (12).



and not the leaves, the method of shaking the fruit would have more possibilities.

#### Conventional Picking Method

To facilitate future work, information was gathered in the 1957-58 season in the form of a motion and time study of the conventional method of picking citrus fruit.

In nine orange groves with tree heights ranging from 16 to 23 feet, 67.7 to 75.8 percent of the picker's time was spent in actually gathering fruit (Table 1). In four grapefruit groves with tree heights rang-

a "Goat" is a stripped-down truck.

ing from 17 to 20 feet, this percent figure was only 59 (Table 2).

Thus, when picking oranges, 17.7 to 25.7 percent of the picker's time (not including delay allowance<sup>1</sup>) was unproductive, as was 34 percent of his time when picking grapefruit.

The "in position" picking rates was 67.2 percent faster when picking oranges from the ground than when picking from a ladder, and on the average one-third of the total fruit was picked from the ground.

This higher "in position" picking rate could be obtained throughout

if the bag and ladder were replaced by some system that would simulate ground picking conditions, however, this higher rate might not be maintained due to fatigue and machine limitations.

Other factors affecting picking rate are shown in Fig. 1. The number of ladder moves increases and the picking rate decreases with an increase in tree size. Here again, the possibility of modifying the tree structure to facilitate harvesting without reducing production per

<sup>1</sup>Delay allowance includes personal and unavoidable delay.

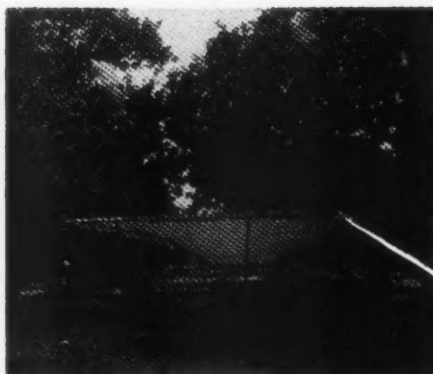


Fig. 2. Catch Frame Mounted on Grove Cart.

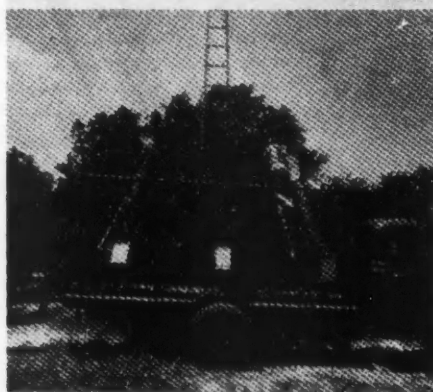


Fig. 3. Mobile Ladder Picking Aid.

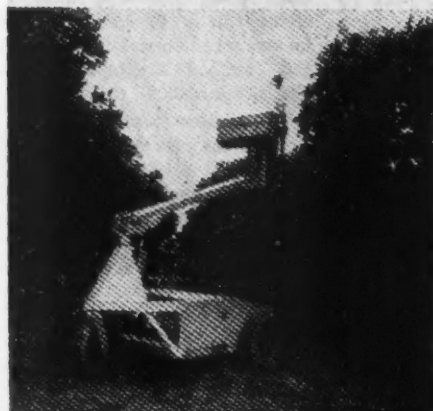


Fig. 4. Self-Propelled Grove Hoist ("Travel Tower").

Table 1. Percentage of Fruit Picker's Time Devoted to Various Work Elements when Picking Oranges from Different Height Trees.

Elements	Tree Height <sup>a</sup> - Feet			
	16-25	16-20	21-25	Average
Positioning Ladder	7.31	7.09	9.63	8.01
Climbing Ladder	4.77	4.41	6.46	5.30
Picking Fruit	75.78	74.80	67.71	72.76
Moving Fruit to Box	5.59	6.36	9.65	7.40
Delay Allowance	6.54	6.54	6.54	6.54

<sup>a</sup> Average tree yield - 9.17 boxes

Table 2. Results of Motion and Time Study for Picking Grapefruit 17 to 20 Feet High Yielding 6-8 1/3 Boxes.

Element	Percent of Total Time
Positioning Ladder	16.39
Climbing Ladder	7.93
Picking Fruit	59.45
Moving Fruit to Box	9.06
Delay Allowance	6.54

Picking Rate (Boxes per Hour) - 12.60  
Average Number Ladder Moves per Tree - 11.11

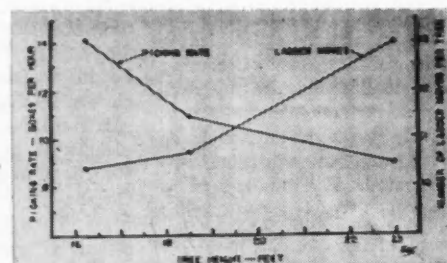


Fig. 1. Effect of Tree Height on Picking Rate and Number of Ladder Moves per Tree.



acre is a factor which warrants consideration.

Time lost while the pickers are waiting for field boxes and ladders, or waiting to be assigned a work area, limits the per day production of the pickers. This is due to poor management and should not be attributed to the pickers. In some cases this waiting period ran as high as 25 percent of the total picking time.

An analysis of the motions involved in picking citrus fruit indicates that the movements are complex and selective. This makes it difficult to design a practical mechanical device to replace the human hand. However, from the above figures it is theoretically possible to increase the productivity of a picker by the following percent in the groves studied:

Oranges:  $(67.2 \times 2/3) + 17.7$  to 25.7  
= 62.5 to 76.5 percent.

Grapefruit:  $(67.2 \times 2/3) + 34$  =  
78.8 percent.

This could be obtained by using a mechanical device that would not change the function of the picker, but would completely eliminate the unproductive time and permit him to pick continuously.

#### Conclusion

**Present Outlook.**—Under current grove conditions it is felt that a fruit picking aid can be developed to position two or more pickers in the tree individually. Such a machine might be justified if it fits in with the operation now termed: "moving fruit from tree to highway truck" (13). It should transport pickers to and from the grove and position them individually in the tree with a minimum of lost time, collect and store picked fruit, and empty the stored fruit into a "High Lift" truck that would service a number of these machines. This machine would reduce the picker's unproductive time, eliminate field boxes, loading crews, ladders, and picking bags, reduce the number of High-Lift trucks required, and eliminate the need for a separate field truck to haul pickers.

**Long Term Outlook.**—Tree shaking shows some promise for grapefruit. The development of a pre-harvest spray which would loosen the fruit but not the leaves would improve the chances of this method being applied to oranges also.

The alteration or training of the tree to form a narrow hedge-

row would greatly increase the possibility of economically justifying any mechanical picking aid. Although hedging is an accepted and advantageous practice (7, 9), little information is available on the horticultural aspects of changing the tree structure so drastically.

#### Acknowledgements

The authors wish to express their thanks to the Blackwelder Manufacturing Company and the Pitman Manufacturing Company for the use of their equipment in this study.

#### Literature Cited

1. Anderson, W. H., Jr. Harvest Labor, the Scene in Florida. American Fruit Grower. Sept. 1958.
2. Burlingame, B. B. Walnut Harvesting Methods, Equipment and Costs. Calif. Agr. Exp. Stn. Ext. Service Circ. 16.
3. Florida Citrus Mutual, Lakeland, Florida. Annual Statistical Report. 1956-57.
4. Harris, R. W. Fruit Tree Structure for Mechanized Operation. Paper presented at Am. Soc. of Agr. Eng. Meeting, Santa Barbara, Calif., June, 1958.
5. Lamouria, L. H., H. T. Hartman, R. W. Harris and C. R. Kaupke. Mechanical Fruit Harvest—Olives, Peaches and Pears. Paper presented at Am. Soc. of Agr. Eng. Meeting, Santa Barbara, Calif. June 1958.
6. R. W. Harris, G. H. Abernathy, S. H. Leonard, Harvester for Canning Fruit. Calif. Agriculture 11: 8. 1957.
7. Norris, R. E. Hedging of Florida Citrus. Fla. Agr. Ext. Circ. 115. June 1953.
8. Phillips, R. V. and W. Grierson. Cost Advantages of Bulk Handling through the Packing House. Proc. Fla.

State Hort. Soc. 70: 1957.

9. Prosser, D. S. Grove Hedging Studies on Citrus. Fla. State Hort. Soc. 67: 1954.

10. W. F. Grierson, Eric Thor, W. F. Newhall and J. K. Samuels. Bulk Handling of Fresh Citrus Fruit. Fla. Agr. Exp. Stn. Bul. 564. June 1955.

11. Research at the Florida Engineering and Industrial Experiment Station 5(12): 18. 1951.

12. Spurlock, A. H. Costs of Picking and Hauling Florida Citrus Fruits, 1956-57 Season. Fla. Agr. Exp. Stn. Agr. Economics Mimeo Report 58-7, Feb. 1958.

13. Thor, E. and L. D. Dohner. Cost of Moving Citrus from Tree onto Highway Trucks as Related to Methods of Handling. Fla. Agr. Exp. Stn. Bul. 547. Sept. 1954.

14. Zuroske, C. H. Economics of Mechanical Orchard Hoists. Washington State Hort. Assn. Proc. 48: 168-169. 1952.

FOR IMMEDIATE  
DELIVERY

**VALENCIAS**

On Rough Lemon

Inspected and Nematode  
Free!

**RALPH JONES**

CROOKED LAKE,  
BABSON PARK

Tel: Lake Wales 2-7917

## A CITRUS SUCCESS ... STORY

Once upon a time, when citrus groves failed to produce profits there was nothing to do but sit back and hope the next season would bring better results. Then along came men who wanted to know WHY. So they TESTED our Florida soil, and PROVED it produces better with the aid of specific requirements . . . specific needs . . . in a specific fertilizer!

That's how FLORIDA FAVORITE FERTILIZER came into existence. It's the PROVEN, economical way to successful citrus profits! The sooner you try it the quicker you'll be telling your own citrus success story!

COMPLETE FIELD SERVICE

**florida  
favorite fertilizer**

INCORPORATED  
PH. MUTUAL 2-1291 • P.O. BOX 912 • LAKELAND, FLA.



Write  
for  
full  
information

a. This does not include unproductive time.

e. "High Lift" is a grove truck equipped with a hydraulically operated body for dumping directly into highway truck.

## Floridians Will Go To Europe To Seek Improved Citrus Market

A United States Grapefruit Mission, headed by prominent Floridians and with support of the U. S. Government, will soon go to England for talks with high British officials on the easing of citrus import restrictions by that country, it was announced here today.

Chairman J. R. Graves and General Manager Homer E. Hooks of the Florida Citrus Commission will head the U. S. delegation, whose purpose is to "seek equality with other non-commonwealth producing areas in the marketing of U. S. fresh and canned grapefruit products in Great Britain." Other members of the mission are Marvin Walker of Lake Wales and C. C. Rathbun of Winter Haven, representing the Florida Canners Association; John T. Lesley, general manager of the Florida Citrus Exchange in Tampa; and M. W. Held of Mission, Texas, representing Texas grapefruit interests.

"Since Florida produces two-thirds of the world's supply of grapefruit and since before World War II, Great Britain was a major market for grapefruit products, we feel we should do all possible to regain this important market," Hooks said. "We have conferred with officials of the U. S. Department of Agriculture and the State Department and they have indicated their support of our mission. At this moment, we are arranging official contact with our embassy in London, through the State Department, so that meetings with British officials will be arranged."

Hooks said his group recognizes British commitments to its grapefruit producing commonwealth, British West Indies, and that the mission's purpose was not "to drive them out of business." On the contrary, he added, they are hopeful of having a meeting in Jamaica with West Indies grapefruit producers prior to the London trip in order to assure them of Florida's cooperation and to enlist their support. He said BWI could not hope to produce enough grapefruit to satisfy Great Britain's demand.

Hooks said he doubted that the British would give an immediate answer which would solve the problem. "It may be weeks or even months before we know what changes in policy may result," Hooks said. "In any case, I'm sure we will make

a strong case for removal of these restrictions."

Hooks said British importers were in full accord with the mission and had joined in the fight to have British import restrictions eased. Present regulations on grapefruit favor Israeli.

"Key figures in the British food importing trade have encouraged us to make this trip and have assured us of their complete support in London," Hooks declared. "We expect to have conferences with them prior to the meetings with responsible British government officials."

The conferences will begin August 20 in London at the United States embassy. This will be followed by meetings with trade groups and finally a series of confabs with British governmental agencies such as the Board of Trade, the Treasury, the Colonial Office, and others.

The meetings are expected to last a week or more, Hooks added.

### FIVE MILLION DOLLAR ADVERTISING CAMPAIGN SET TO FLORIDA CITRUS SALES

Described by officials as "new and exciting," the Florida Citrus Commission's \$5,300,000 advertising and merchandising program for next season will be unveiled to the Northern trade in a series of 15 trade luncheons, beginning September 28, it has been announced.

According to Frank D. Arn, director of advertising and merchandising, members of the Commission staff will take details of the Florida citrus advertising and merchandising plans to an estimated 2000 retailers, wholesalers, brokers and distributors in North America's 15 top markets.

Arn said the whirlwind three

week program will get underway in Detroit, Michigan, on September 28, and conclude in Quebec City, Quebec, on October 23.

"Not only will we show them our new and exciting consumer advertising and merchandising plans, but we will also describe in detail our food publicity program plus our professional and ethical advertising aimed at the medical and dental professions," Arn said.

As to the merchandising phase of the program, Arn said several new and attractive display pieces, tied closely with the advertising theme, will be shown for the first time.

"We will also unveil complete merchandising kits assembled specifically for the several promotional drives we expect to conduct during the season," he added.

Arn, merchandising manager Ralph Henry and advertising manager H. S. Gardner will conduct the luncheon series. Homer E. Hooks, General Manager, is expected to attend some of the sessions as are some of the Commissioners.

Arn said that any Florida grower, packer, shipper or processor who happens to be in an area where a trade luncheon is being held, is cordially invited to attend. He emphasized that the trade is always anxious to talk to Florida suppliers.

Dates and locations of the 15 meetings include Detroit, Michigan, September 28; Cleveland, Ohio, September 29; Cincinnati, Ohio, September 30; Chicago, Illinois, October 1; and St. Louis, Missouri, October 2.

Pittsburg, Pennsylvania, October 5; Boston, Massachusetts, October 6; New York, New York, October 7; Philadelphia, Pennsylvania, October 8; and Washington, D. C., October 9.

Minneapolis, Minnesota, October 19; Buffalo, New York, October 20; Toronto, Ontario, October 21; Montreal, Quebec, October 22; and Quebec City, Quebec, October 23.

**SOUTHERN DOLOMITE**  
**PALMETTO, FLORIDA**  
**PHONE: BRADENTON 2-1411**

## Florida Citrus Growers Administrative and Shippers Advisory Committee Members Named

The U. S. Department of Agriculture has announced appointment of eight members and their alternates to the Growers Administrative Committee and to the Shippers Advisory Committee to serve under the amended marketing agreement and order program regulating the handling of oranges, grapefruit, tangerines, and tangelos grown in the State of Florida.

The period covered by these appointments is August 1, 1959, through July 31, 1960.

Members and their alternates named to the Growers Administrative Committee are:

A. B. Angle and W. R. McMullen, both of Tampa; B. B. Osgood, Montverde, and E. L. Atkinson, Umatilla; William H. Mayfield and W. A. Prevatt, both of Seville; Chester J. Karst, Orlando, and Jack H. Ross, Oakland; Philip C. Gates, Fort Pierce, and Alexander W. Ryburn, Vero Beach; Charles G. Metcalfe, Avon Park, and Cole Danley, Jr., Lake Placid; Alfred S. Estes and L. B. Anderson, Jr., both of Winter Haven; George W. Barr, Winter Haven, and Erle L. Wirt, Jr., Babson Park.

Members and their alternates named to the Shippers Advisory Committee are:

Harry G. Gumprecht, Jr., and Fred S. Johnston, both of Tampa; A. T. Brandon, Waverly, and Philip Christian Peters, Winter Garden; C. M. Seraphine and R. W. Graves, both of Vero Beach; Robert E. Snively, Winter Haven, and Jules W. Bragin, Clearwater; James A. Henderson, Frostproof, and Ralph Wetherington, Winter Haven; John G. Ariko, Orlando, and S. C. Battaglia, Winter Park; Robin Banks, Winter Garden, and Sam A. Banks, Lakeland; John Schirard, Jr. and Ernest M. Southward, both of Sanford.

The Shippers Advisory Committee makes recommendations to the Growers Administrative Committee, when it is deemed advisable, to limit the shipment of certain grades and sizes of oranges, grapefruit, tangerines, and tangelos. The Growers Administrative Committee considers these recommendations and then submits its own recommendations, together with those of the Shippers

Advisory Committee, to the Secretary of Agriculture. The Growers Administrative Committee also serves as the official administrative body under the amended marketing agreement and order program.

### RUSSIA INDICATES DESIRE TO BUY FLORIDA CITRUS

A representative of the Florida Citrus Commission has received an invitation to go to Russia and discuss the possibility of Florida citrus exports to that country—but the Commission has vetoed the idea for the present, it is revealed.

Alfred LaRocque, Commission regional manager in Frankfurt, Germany, said in a report received here today that two Russian officials had contacted him at the International Food Exposition in Bern, Switzerland, and proposed the meeting. The Exposition, biggest in Europe, closed last week after a spectacular 16-day run.

Frank D. Arn, director of advertising and merchandising for the Commission under whose supervision LaRocque works, said the conclave would not take place "unless the Russians show more genuine good faith by liberalizing money and import rules into that country."

LaRocque identified the two Russians as Oleg Velikorestkii of the Institute for Studies and Projects of Commercial Enterprises in Moscow, and Alexander Chalimov, director of the Ministry of Commerce from the Ukraine. He said they visited the Commission's booth at the Fair, saw the Commission's foreign version of the popular film, "The Sun Goes North," and collected all available information on the Florida citrus industry.

"Neither of them spoke English or French, but one spoke a little German so we got along very nicely," LaRocque reported. He said they were given samples of canned Florida juices and grapefruit sections.

LaRocque quoted the Russians as saying that limited quantities of citrus fruits and juices had been purchased by USSR from Israel and Spain, but that they wished Florida products could be made available.

### FRUIT AUCTIONS PLAY NEW ROLE IN MARKETING

Changes in fruit marketing during the past 25 years have altered the role and importance of fruit auctions. The auctions are now becoming more and more distributors of higher-priced specialty products rather than mass distributors of more standardized fruits, according to a report issued by the U. S. Department of Agriculture.

Population growth in the South and West, away from the cities having auction markets, has caused a decline in the past 20 years in the share of the national supply received in the markets of the auction cities of the Northeast and Midwest.

The number of retailer groups large enough to take advantage of direct buying of supplies at shipping point—thus bypassing the auctions—has grown until they now handle a large portion of the retail food business, Agricultural Marketing Service researchers learned.

The terminal market, however, is still important in supplying buyers who are not well adapted to direct buying, such as the institutional trade, small grocery stores, and specialty fruit and vegetable stores.

The fruit auctions, located in railroad terminals, were developed to sell commodities received by rail. The shift from rail to truck shipments of fruits and vegetables has meant that a declining share of the total movement to market is available for auction sale. Thus, the preference of the auctions for rail receipts is another factor in the declining proportion of sales through the auctions.

Auction selling, however, still concentrates on fruits from the distant specialized production areas, such as imported fruit and Western deciduous fruit.

### Pineapple & Valencias

on rough lemon stock

Certified (Psorosis Free)

Reliable Service — Fair Prices

Immediate Delivery

**LEWIS AND MYERS  
CITRUS NURSERY**

FT. MEADE, FLORIDA

Tel. Atwater 4-4261



## Constant Defense Against Plant Pests Is Stressed By USDA

The necessity for continuous defense against the entry of plant pests into the United States has been driven home with word from Miami that the Medfly twice has been intercepted there in recent weeks by quarantine officials.

Serving as an alarm system against such entry into Florida is the quarantine program of the U. S. Department of Agriculture, backed up by the trapping lines maintained at all strategic points by the USDA and the State Plant Board. No specimen of dangerous fruit fly has been discovered in the trap network since recovery of an adult Mediterranean fruit fly in November, 1957. Larvae of many fruit flies have been found at all ports of entry in the United States, however.

Two of the most recent instances of such finds occurred in Miami when quarantine authorities checked tourists returning from South America with mementos of fruited twigs taken from coffee plants. In each instance, larvae of the Medfly were found in the coffee berries.

The interceptions brought a word of caution from J. Robins Wood, inspector in charge of the USDA plant quarantine office in Miami.

"Travelers should be warned that even small lots of apparently innocuous plant material could be the means of reintroducing the Mediterranean fruit fly or other equally destructive pest," he said.

Wood pointed out that the Medfly probably reached Florida in 1956 through similar movement of fly larva in the baggage of tourists. The last time this happened, he reminded, state and federal governments had to ante up almost \$11,000,000 to eradicate the pest.

## MORE THAN THREE MILLION CITRUS SPOONS ARE IN USE . . .

Florida Citrus Mutual's new grapefruit spoon isn't the only gadget that has been designed to take the fuss and bother out of grapefruit eating.

But it's the only one that's evoked such comment as: "It's a joy to eat grapefruit now; makes eating and preparation so easy,—even my 4-

## FARM SAFETY IS EMPHASIZED

Gainesville, Fla. — Florida and the nation observed the 16th annual National Farm Safety Week July 19-25.

A. M. Pettis, associate agricultural engineer with the Florida Agricultural Extension Service, says the week is sponsored jointly by the National Safety Council and the U. S. Department of Agriculture.

"Safety Makes Sense" is the theme of this year's observance, with emphasis on accident prevention among farm families. "Facts surrounding farm accidents must be brought to the attention of every rural resident", says Pettis.

National Farm Safety Week was first observed in 1944 and has been observed annually ever since. There has been a steady decline in deaths and injuries over the years.

In 1950, the death rate per 100,000 farm persons was 62. Last year the number had fallen to about 57. The number of accidental injuries on the farm in the last nine years has decreased by about 300,000.

"The only way to lick farm accidents", says Pettis, "is to think safety, talk safety, and, most important, practice safety".

year-old can manage without help".

Mutual receives hundreds of postcards every week from people saying nice things about the famous grapefruit spoon. Currently, there are almost 3,000,000 such spoons in use in the U. S.

With this little gadget in hand, all the eater has to do is to cut the grapefruit in half and dig in. The serrated tip does the work, eliminating sectionizing and all the other mussy preparation which use to cause housewives to think twice before serving it every morning for breakfast.

## FFVA Forthcoming Convention Plans Are Developing

J. P. Harlee, Jr. Palmetto, general chairman for the 16th annual convention of the Florida Fruit & Vegetable Association, said today that plans for the forthcoming event are well developed.

The meeting will be held at Hotel Fontainebleau, Miami Beach, Florida, on September 23, 24 and 25, 1959.

"The theme for the 1959 convention will be 'Agriculture at the Crossroads,'" said Harlee.

"This broad topic will be advanced from the various aspects of growing, shipping and merchandising, as well as government regulations and research.


"We have invited a number of distinguished speakers to develop this theme and we have already received tentative acceptances from several. Firm acceptances will be announced as they are received," said Harlee.

## CHARITY HORSE SHOW WILL BE HELD IN COMING YEAR

The Polk County Sheriff's Mounted Posse has launched plans to sponsor The Imperial Charity Horse Show which will take place early next year.

The Show, with proceeds going to the Florida Sheriff's Boys Ranch, will be on the Florida Sunshine Circuit featuring Classes for: Five and Three Gaited Horses, Harness, Roadsters, Walking Horses, Equitation, Five Gaited Ponies, and Western Pleasure, plus parade and drills by members of the Sheriff's Mounted Posse Drill Team.

\$8000 in prizes, trophies and ribbons will be awarded by Registered American Horse Show Association judges.




# SUPERIOR

FERTILIZER AND CHEMICAL COMPANY

**FERTILIZERS AND INSECTICIDES THAT ARE SUPERIOR**

Factories and Offices: TAMPA and FORT PIERCE, FLORIDA





## Standards For Lemon Juice for Manufacturing Announced

Issuance of United States Standards for Grades of Concentrated Lemon Juice for manufacturing has been announced by the U. S. Department of Agriculture. These are the first standards issued for the product.

The standards apply to concentrated lemon juice which has been preserved by canning, freezing, approved additives, or by any other suitable method. They provide for grades A and C for manufacturing. Concentration may be to any suitable level of acidity. Acidity is measured in grams anhydrous citric acid per liter of product.

Limits for pulp are not included in the grades, although methods of analysis are specified for making pulp determinations.

Provision is made for products concentrated to any suitable degree. However, the quality factors of color and defects are evaluated after reconstituting the product to 5.7 grams per 100 milliliters, and the flavor factor is evaluated after preparing to a formula with sugar and water.

## Tournament of Roses Parade To Be Telecast On New Year's Day

The 1960 Tournament of Roses Parade in Pasadena, Calif., on New Year's Day will be telecast internationally under the sponsorship of Minute Maid Frozen Juices and Hi-C Fruit Drinks, according to Howard G. Dick, Sales Vice President of Minute Maid Corporation.

Dick said Minute Maid last week signed a contract with the National Broadcasting Company for color telecasting the 71st annual parade over more than 200 NBC stations throughout the United States and Canada.

NBC commentators Betty White, John Davidson and Roy Neal will narrate the 90-minute telecast again this year, he said, adding that it will be carried in both English and French languages on the Canadian television stations. The spectacular annual floral parade, first held in

1889, last year was televised into more than 15,000,000 homes.

Dick said Minute Maid Corporation will enter another float in the 1960 floral pageant, but that float plans have not yet been released. Last year's Minute Maid entry was 55 feet long and 17 feet high, and was composed of more than 50,000 fresh-cut blossoms.

A new farm tractor tire with radial cord-ply designed produced more traction and power efficiency

than the conventional tractor tire in recent U. S. Department of Agriculture tests, it was reported.



## COVER THE TOPS — Spray through thickest foliage with Speed Sprayer's New Oscillating Volute

In the thickest, heavy "shouldered" citrus foliage, or at the tops of large trees, you'll get thorough spray coverage with Speed Sprayer's new grove oscillating volute attachment. The oscillating blades direct the air stream in an up and down motion that causes the foliage to rise and fall. This foliage movement opens up the branches to provide top penetration and through-the-tree coverage never before possible. The volute may be purchased for either right or left discharge. Ask your Speed Sprayer representative to demonstrate the new volute attachment on the Speed Sprayer sized to fit your needs.

**FREE HANDY CALCULATOR**  
Send now for the handy calculator for figuring concentrate or dilute spray solutions. It's FREE!

For latest data on  
**SHUR-RANE**  
ENGINEERED IRRIGATION  
WRITE US AT ORLANDO

ASK ABOUT OUR LIBERAL TRADE-IN AND FINANCING PLANS  
**SPEED SPRAYER FACTORY, ORLANDO, FLORIDA**



**John BEAN**

LANSING 4, MICHIGAN  
ORLANDO, FLORIDA

Division of Food Machinery and Chemical Corporation

# Refrigerated Warehouse Practices...

The following article represents excerpts dealing with refrigerated warehouse practices and preparation and processing citrus fruit for market are taken from a brochure prepared by the American Society of Refrigerating Engineers.

The authors are J. R. Macrill, field laboratory, Sunkist Growers, Inc., Ontario, California; Herman William Nixon (retired), formerly with the California Fruit Growers Exchange and Dr. Paul L. Harding, Principal Plant Pathologist, Quality Maintenance and Improvement Section, Agricultural Marketing Service, U. S. Department of Agriculture, Orlando, Florida

## Harvesting and Packing-House Handling

Proper picking and handling of citrus fruits in the orchard and packing-house involve many operations that have been continually improved for more than 50 years. The packing-sheds of the early days have been replaced by well designed and substantially constructed packing plants.

These are now equipped with modern machinery for handling the fruit in a careful and economic manner. The art of good handling has gradually changed from a strictly laborious task to one involving scientific knowledge and technical skill. In general all citrus fruits require the greatest care in handling to prevent mechanical injury, excessive deterioration, and decay.

## Picking

In California citrus fruits are harvested throughout the year. Picking is largely in the hands of the packing associations, and is performed by trained crews. It has been found that the associations can organize and perform the work better and more efficiently, and keep picking policies in better line with the market situation than the growers.

Special wooden field boxes with tight bottoms are provided to prevent the entrance of orchard dirt, and are kept in repair and free of rot residues, dirt, litter, splinters and protruding nails. Canvas picking sacks of the closed-mouth type, holding approximately a half box of fruit, are now commonly used. Clippers of special design are used and ladders are provided for picking

fruit beyond reach. Gloves are required during picking to avoid finger nail injuries to the tender rind.

Picking is discontinued when trees are wet to avoid green-spotting due to oil liberated from the rind and, whenever possible for a period of several days following severe hail or wind storms, or after excessive frost or heat damage has occurred, to allow healing of injuries and to give time for evidence of damage to appear so that when picking is resumed better grade separation is possible.

The fruit is cut from the stem just above the button. When lemons are picked two cuts are required; one with a short length of stem attached, the second close to the button. Much attention is paid to the quality of work performed and inspection is maintained to avoid long stems, clipper cutting of the rind, and pulling. Cutting of the lemon button should be avoided.

In Florida, bulk handling of citrus fruit using field crates or baskets is gradually replacing field boxes because of the economy of operation. A saving of five to seven cents per

box for field operations and two to three cents per box for packing-house operations are not unusual. Changeover costs are amortized by savings in four or five years under normal conditions.

## Packing-House Handling

In the packing-house, citrus fruits are prepared for shipment by a number of carefully directed operations which are varied to suit the variety or quality of the fruit and market requirements. The general aim is to keep deterioration and decay to the minimum and prepare the fruit in an attractive manner.

Wherever necessary throughout the packing-house, gloves are worn to protect the fruit. All parts of the packing-house are kept clean and sanitary. Mold spores and wet rots are not allowed to contaminate work room floors, storage rooms, or equipment; all decaying fruit is hauled promptly to a disposal point far removed from the packing-house.

After the fruit is received at the packing-house, it is washed by means of a mechanical washer. Each washer is provided with a soaking tank from 20-30 ft. long through which

## You need a BATH! YES, A WORLD-FAMOUS HOT SPRINGS THERMAL BATH

If you're healthy, you'll probably live longer because as it's said, "an ounce of prevention is worth a pound of cure." If you're nervous, tired, rundown or stiff from rheumatism and arthritis, you can find relief as thousands of others have. *You'll find the best at The Majestic* where you can go from your room to the bathhouse in robe and slippers. Here you will find specialists who know their business—experienced attendants and masseurs for the men and masseuses for the ladies—all licensed in accordance with the regulations under the Director of the Nat'l Park Service, U. S. Dep't of the Interior.

THE *Majestic* HOT SPRINGS  
HOTEL & BATHS NATIONAL PARK ARKANSAS

HEATED SWIMMING POOL  
Write the MAJESTIC today!

ROOMS from—  
\$4 per day single  
\$6—double  
and you can budget  
MEALS at \$4.50 per day

the fruit is floated before passing into the washer itself.

All decay that has developed in the field boxes since picking is removed before the fruit enters the soaking tank. Some tanks have submersers 10-15 ft. long to immerse the fruit during the soaking period. It has been found that complete immersion is necessary both to facilitate cleaning and to give the maximum mold control treatment. A solution of soap for cleaning purposes, and usually also a mold retardant to control decay, are used in these tanks. Sometimes a separate tank immediately following the washer is used for the mold control treatment.

If fruit is smudge-stained due to orchard heating, kerosene or a solvent emulsion is added. A wash water temperature from 115-120 F is maintained to assist in cleaning and to aid in the control of many diseases, particularly brown rot. To avoid liberating oil from the rind and causing preen-spotting and decay, it is usually necessary to hold lemons on the packing-house floor for 24-72 hr. prior to washing.

The washer itself is generally constructed with cylindrical brushes, arranged horizontally in a series. These revolve rapidly and the fruit is conveyed onto them and brushed in a solution pumped from the soaking tank. A fresh water rinse, preferably warm, is applied both after washing and treating.

Oranges, after washing, are dried by mechanical equipment that includes a series of propeller fans which move large volumes of air over the fruit. When dried, the fruit is polished and waxed, and then passed immediately to the grading table. After grading, it is conveyed to sizing equipment which separates the oranges into the standard sizes and drops them into the bins for packing.

Grading is usually accomplished by removing the lower grades from the first grade, allowing the higher grade to move forward without handling to the packing equipment. Sometimes "check-graders" are used to aid in maintaining a uniformly satisfactory grade.

The grading operation is particularly important as it is the final classification of the fruit before shipment. Sound judgment and unusual care are required to determine the proper grading of each lot, because of wide variations in the quality of fruit from different groves. When lemons and grapefruit are taken out of storage for grading and shipment, fruit that has decayed is

removed, and in addition all sound fruits touching decayed ones are discarded because they may be infected. Sound lemons touching spoiled ones and known as contacts are usually sent directly to a by-product plant.

The diseases most commonly seen in lemons and grapefruit after storage are green mold, blue contact mold, brown rot, sour rot, grey mold, cottony rot, Alternaria rot, and Trichoderma rot.

In addition to decay there are a number of other defects that have to be considered in grading the fruit. Each blemish is judged and the fruit affected placed in its proper grade according to the nature of the defect or as grade rules specify.

Constant inspection by cutting is necessary to determine the internal quality of each lot, and often tests are made by cutting a sample of the fruit before or after grading to determine the exact percentage of off-grade fruit present and, therefore, the brand under which such fruit should be shipped. The segregation of frost damaged fruit and granulation of Valencia oranges are often accomplished by fluoroscopic examination.

Since the fiberboard carton has become the standard container for

the greater part of citrus shipments from California, some of the older practices have been eliminated. Fruit packed in the fiberboard container is not wrapped. In the case of lemons, the fruit is bulk- or volume-filled instead of being place packed as is done by orange and grapefruit shippers.

The container has the printed name of the shipper, marketing organization and other information required by law. After being packed and filled with fruit, the flaps are closed and sealed on an automatic gluing and sealing machine.

After sealing, the packages are conveyed to the precooling rooms or to standard refrigerator cars for shipment to market. Containers are loaded into cars flat, usually five layers high in a chimney type stacking arrangement for more uniform distribution of air.

#### Accelerated Coloring or Sweating

Two varieties of oranges, Washington Navel and Valencia, constitute the major portion of the California crop. The harvesting of each variety requires approximately six months, but since the Navels mature in November and Valencias in May, fresh oranges are available throughout the entire year. Grapefruit from the desert areas of California

(Continued on page 18)

## Fertilizing Costs Cut!

Successful Citrus Growers know that Killebrew's "BULK HAULER" and "SPRED-O-MATIC" will distribute your Fertilizer faster and more economically! See the "SPRED-O-MATIC YOUNG TREE ATTACHMENT," it puts the fertilizer where it will do the most good for those new plantings at the rate of 1/2 to 6 pounds per tree.

Ask For A Demonstration . . . No Obligation

**Sam Killebrew, Inc.**

Phone WOodlawn 7-1871

P. O. Box 1068 . . . AUBURNDAL, FLORIDA

**BULK HAULER** \*

*Spred-O-Matic*

ADVERTISEMENT — LYONS FERTILIZER COMPANY

# The LYONIZER

COMPILED BY THE LYONS FERTILIZER COMPANY

## Reports Of Our Field Men . . .

### NORTH CENTRAL FLORIDA

V. E. Bourland  
Winter Garden, Fla.  
Phone 107

We are having quite a bit of heavy rain, although it has been spotted with water standing in places where it hasn't in years, however not too much damage to groves yet. Lakes are up higher than they have been in a long time. Most of groves have good cover crops, some growers are already chopping. Fruit is sizing very good, and most growers are spraying and dusting trying to keep their fruit bright. There is considerable bloom in some groves, growth has been good, especially on young trees.

### NORTH CENTRAL FLORIDA

L. D. Geiger, Jr.,  
Phone STATE 7-3952  
Leesburg, Fla.

Mid-July in north central Florida finds the weather very hot. In the past several days we have had several good rains and in some places has been about five inches.

Most of the grove men are again very busy putting on the summer spray. Rustmite and scale are the two most important items to be considered in this spray.

The strawberry plant growers in the Webster area are very busy getting their plants set out in the plant beds. In most cases with the large amount of rain we have been getting, the plants are doing very well.

The pastures in this area are looking mighty good also and with the good cattle market it looks as if pasture well taken care of will pay off well.

### HIGHLANDS AND POLK COUNTIES

R. E. Lassiter, Jr., & R. S. Carlin  
P. O. Box 1304  
Winter Haven, Fla.

Rainfall in this area during the past month has continued to be well above normal and citrus trees are covered with a beautiful growth. The rains have slowed the application of the Summer scalecide sprays. However, most growers

seem to be about through spraying.

It would be wise to keep a close check behind these sprays for Rust Mite infestations due to the fact that rains may be washing materials off shortly after application. We have been noticing quite a few heavy infestations of Red Scale to be present. These populations should be checked in order to make sure good control has been accomplished.

Some growers have started applying Dolomite where necessary and chances are quite a bit more will be applied during the next month.

We have run into trouble with young trees which were planted this Spring by finding that they are dying back even after persistent watering and other care. We find that this may be principally due to cold damage received while these trees were in the nursery and thus preventing normal growth on being set in the grove. Young trees should receive regular applications of fertilizer throughout the Summer in order to insure good growth.

### SOUTH HILLSBOROUGH, MANATEE AND SARASOTA COUNTIES

Eaves Allison  
P. O. Box 365, Sarasota, Fla.  
Phone Fulton 8-2611

No complaints on the moisture situation for the months of June and July. All sections have had from ample to too much! Some groves with a drainage problem are showing some signs of wet feet. Fruit is sizing up nicely and gives promise of desirable size and quality for the coming harvest.

All applications of oil and zineb have been made - and the last of the summer applications of fertilizer have been put on bearing groves and the groves 'laid by'. Cover crops are growing pretty rank, to furnish that much-needed supply of organic matter which comes so expensive 'in the bag'. Groves both young and old may look good with the middles harrowed bare, but the ones that are building up to a pro-

fitable old age are those with lots of cover crop growing up to within a few feet of the trees.

This is vacation time for many - but others are reading their land for fall vegetable crops and it will not be long before the first seeds will be going into the ground.

Pasture grasses are green and heavy, with the water table very favorable for continued growth.

### SOUTH POLK, HIGHLANDS, HARDEE AND DeSOTO COUNTIES

C. R. Wingfield  
Phone: Glandale 2-8181  
Avon Park, Fla.

I have just returned from my vacation (19th) and have not been able to make a survey of territory before press time. However indications are that everything is normal for this season of the year. Moisture continues good and citrus trees are holding a good color with new growth. With moisture having been good our cover crops are growing nicely. Those who laid by early are ready to start chopping it down. Fertilizer to young trees should be kept on schedule to assure as many flush of growths during the summer season as possible but be sure that the last application is early enough for the growth to harden before any cold weather.

Vegetable growers are preparing their lands for the fall and winter crops both in this area and on the East Coast. It is too early to tell just how much will be planted at this time.

LYONS  
FERTILIZERS  
PRODUCE  
MAXIMUM CROPS  
OF  
FINEST QUALITY



## ADVERTISEMENT — LYONS FERTILIZER COMPANY

*Uncle Bill Says:*

This is the time of the year that most folks who kin make it plan to take vacations . . . we kin remember when we felt that going away on vacations . . . even short ones . . . was jist a waste of time . . . but of late years we have come to figger that most every one will find that takin' a little time off each year finds that when he comes home he has left a lot of brain cobwebs somewhere along the way.

Even if he spends all his time travellin' most folks will admit that just a change of scenery and a change of daily habits does a lot to make a guy feel better when he gits home.

About this time of the year there is less than usual fer the average grower to do around his place . . . and when he takes his family along on his vacation, they git a much deserved change too.

And this year the matter of cost is not as much of a factor as it was in seasons when crop prices were low . . . so even an old guy like me is gettin' ready right now to take off fer places where all we got to do is to enjoy ourselves, knowing that when we git back home our grove will be waitin' fer us, and we'll be ready to git to work on it again and see that it produces the finest crop, that proper fertilization and good cultural practices can produce.

They is one thing a vacation won't change fer us, 'n that is our habit of many years of fertilizing our grove with Lyons fertilizers knowing that this practice will produce Maximum Crops of Finest Quality.

## REFRIGERATED WAREHOUSE PRACTICES . . .

(Continued from page 15)

and Arizona is available for seven to eight months of the year, and grapefruit from central and southern California is available for the remainder of the time.

All varieties of citrus fruit must be mature before they are picked. Color is not always a criterion of maturity. The natural change of color in oranges from dark green to deep orange is a gradual process while the fruit remains on the tree, the fruit remaining dark green from its formation to the time it is nearly full size and approaching maturity, when a stage is reached where the color changes may become very rapid.

The color change is influenced greatly by temperature variations. A few cold nights followed by warm days may completely color oranges that were previously very green. The color changes in melons and grapefruit are similar, except that the final color is yellow. Unfavorable weather conditions may delay coloring even after the fruit is fully mature.

Up to a certain point, the natural color changes in the Valencia orange follow the trend described, but complete or nearly complete orange color generally develops some time before the fruit is mature and green color may return after the fruit has reached its prime. Navel oranges and grapefruit harvested in early winter may be mature and of good eating quality although the rind is green in color.

Sweat rooms are arranged equipped with an evaporative cooling unit suspended from the ceiling. These units may also be equipped with an electric or steam coil for heating during cold weather. Air is circulated continuously to maintain a uniform temperature of 65-70 F during the sweating operation.

One part of ethylene in 50,000 to 200,000 parts of air (the concentration depending upon the variety and the intensity of green pigment in the rind) is maintained in the sweat-rooms. During this operation fresh air is introduced into the room, and a relative humidity of 88-90% is maintained. To avoid excessive deterioration of the fruit during the sweating operation, it must be carefully done by trained personnel.

Oranges and grapefruit that require this treatment are placed in the sweat-rooms as soon as delivered to the packing house.

In Florida and Texas the methods

of harvesting and packinghouse handling of oranges and grapefruit are quite similar to those used in California. Legal standards of maturity vary somewhat from state to state, and in Florida, maturity of of round oranges, tangerines, Temple oranges and grapefruit is based on a designated break in rind color, a minimum volume of juice, minimum total solids content and graduated total solids-acid ratio. Standards are slightly higher in Florida for oranges given the color-added treatment.

A high percentage of Florida's early and midseason varieties of oranges receive the color-added treatment. The treatment causes the rind of pale fruit to take on a

(Continued on Next Page)

## Classified Ads

### SUPERIOR CITRUS TREES

Registered psorosis-free and regular budded stock grown on high, virgin land, certified nematode-free. Protected by wind machines and fuel for assured delivery in Fall 1959 and Spring 1960.

Will bud on order for 1960 and later delivery.

For quotations write or call Glendale 2-7541. Will send Citrus Newsletter and price list on request.

### WARD'S NURSERY, INC.

BOX 546 AVON PARK, FLA.

Serving the citrus industry since 1924

### FOR SALE

READY FOR PLANTING: 3,500 Valencias, 1,000 Marsh Seedless Grapefruit, 1,500 Hamlins and 200 Clementines. 2 year old bud on Rough Lemon. State Plant Board inspected. \$1.00 each or \$4,500.00 for whole nursery.

Robert Oliva, P. O. Box 122, San Antonio, Fla. Pasco County. Phone L07-5520.

Be Sure — get the best rootstock for your grove. We have found, from experience, Cleopatra to be more resistant to cold; diseases; wetness; adaptable to a wide variety of soils, and produces a high quality of fruit. We have all varieties for immediate, fall and spring planting. Place your order now. MAY BROTHERS, E17-3454 Box 805, Umatilla, Fla.

## GROVE PROBLEMS?

Consult Dr. Wolf to bring back and keep your grove in top condition. Phone or write for free details.

### DR. WOLF'S LABS

2620 Taylor St.  
HOLLYWOOD, FLORIDA  
Phone: WA 2-2808

INDIAN RIVER GROVES — Any size of your request — No freeze damage.

LEVERE MONTGOMERY,  
REALTOR  
2010 ORANGE AVENUE  
FT. PIERCE, FLA.  
PH. HO 1-7990 or HO 1-3666

CITRUS TREES FOR SALE — Large quantity for immediate digging of: lemon root valencias \$1.00 each; lemon root hamlins \$1.00 each; lemon root pineapples \$1.00 each; lemon root Marsh Seedless grapefruit \$1.00 each; Eureka or Queens (seedling orange bud on lemon root) \$1.00 each; also limited quantity for immediate digging of: sour root hamlins \$1.40 each. Large quantity for spring of 1960 delivery of: sour root hamlins \$1.15 each. These trees are all certified nematode free — will caliper 5/8" or better with the majority 3/4" or better. For further information write, wire or call: P. J. HENDRICKSON, Box 558, Dade City, Florida. Phone (day) Logan 7-5671 or (night) Logan 7-5557.

FOR YOUR FUTURE Citrus Plantings, we have certified stock of sour orange, cleo and lemon root. Varieties and prices quoted on request. Crescent Farms, Box 890, Bradenton, Florida. Phone 2-3821 or 2-7004.

BUDDING YOUR VARIETY OF CITRUS NOW on contract for Spring and Summer 1960 delivery. Registered or non-registered; certified nematode-free; on lemon, sweet, Cleopatra and sour stocks. GRAND ISLAND NURSERIES, Box 906, Eustis, Florida

### GENUINE PARTS GUARANTEED SERVICE

### POUNDS TRACTOR CO.

Your Case and Hardie  
Dealer

### Two Locations:

3rd & Ave. "D" — S. W.  
WINTER HAVEN

102 North Rest Ave.  
AVON PARK

brighter and more uniform color. Color-added is a certified food dye and the treatment is usually in addition to that of degreening by the use of ethylene gas.

In this process, the fruit is subjected for two or three minutes to the dye solution, which is maintained at about 120 F. The color-added treatment can be given in an immersion tank filled with dye solution, or the dye can be flooded on the fruit as it passes on a roller conveyor.

The color added tank is located between the washer and antiseptic tank, with arrangements made for by-passing when the color-added treatment is not wanted. Oranges with desired color at harvest time, as well as tangerines and grapefruit, are by-passed around the dye tank, or the flow of dye may be cut off as the fruit passes.

Various containers are used in Florida. The one in use over the longest period is the standard, or two-compartment, nailed box constructed of pine or veneered gum, with a capacity of 1.6 bushels. It is somewhat larger than the standard California box, which has a capacity of 1.47 bushels.

Within the past 15 years the single-compartment, wire-bound crate has gained greatly in popularity and is now in more general use than the standard box but is built of lighter material and is cheaper. Fruit packed in this container is seldom wrapped. The 1 3/5 bushel wire-bound crate is used in Florida for oranges and grapefruit; the 4/5 bushel crate patterned after the larger one is used for tangerines, Temple oranges and limes.

#### Uniform Temperature Control

The maintenance of a uniform temperature of 58 F is of great importance. As in the groves fluctuating or low temperatures in storage rooms cause lemons to develop an undesirable higher color or bronzing of the rind. Temperatures of 52 F and lower cause a staining or darkening of the membranes dividing the segments of the edible pulp and may affect the flavor. Temperatures above 60 F shorten the storage life and are more favorable to the growth of decay-producing organisms.

Proper stacking of the fruit in storage rooms is important to secure uniform air circulation and temperature control. There should be not less than two inches between stacks, four inches between rows, and at intervals there should be trucking aisles at least six feet wide.

#### Control of Relative Humidity

In some sections of California, a relative humidity of 86-88% is usually ideal, while in other sections lower relative humidity would be more nearly ideal for curing the rind. The desirable relative humidity may also vary with the season, vitality of the fruit, and previous outside weather conditions. Unless normal shrinkage and curing of the rind are accomplished in the storage rooms, they will occur rapidly in transit to market, and loose unsightly appearing packages will be delivered to the buyers.

Excessive moisture content in the air of storage rooms does not permit proper curing and favors the growth of molds on the fruit and on the wood of storage boxes.

The air washer, because of its utility and efficiency, is essential. The velocity of air should not exceed 500 fpm through the free area. A spray chamber with two banks of spray nozzles opposing each other produces fine spray under higher water pressure. This is desirable for air cleaning and high humidity control. Sufficient area and capacity to take full advantage of low outside wet bulb conditions are an operating economy to the owner.

Air Conditioning equipment must be automatically controlled. The design and flexibility of the control system must be such that varying conditions may be easily obtained. Pneumatic or electrical controls are desirable for all citrus storage because of their operating efficiency.

In all building construction and especially in storage rooms with refrigeration and air conditioning, good engineering is the least expensive service that can be purchased.

Florida grapefruit is frequently placed in storage for short periods of time—four to six weeks. The incidence of decay and rind pitting are deterrents of long time storage and may develop in the fruit during storage or during shelf life following storage.

Decay is controlled by storage at 32 F. On the other hand, pitting of rind is prevented by storage at 50 F. Practical benefits are reported in keeping quality of Marsh grapefruit through a storage program of placing the fruit for one or two weeks at 50 F before it is transferred to 2 F for either four, six or eight weeks, plus seven days at 70 F.

(Continued Next Issue)

## KEEP INFORMED

On Matters

Pertaining To Citrus Production

By Reading

THE CITRUS INDUSTRY

Every Month

Tear Out and Mail Coupon Below

The Citrus Industry,  
Bartow, Florida

Please send me The Citrus Industry for 1 ( ),  
2 ( ), or 3 ( ) years.

Name \_\_\_\_\_

Address \_\_\_\_\_

#### SUBSCRIPTION RATES:

1 Year \$1.00 — 3 years \$2.50 — 5 years \$4.00

# FERTILIZERS

# PRODUCE

**TAMPA, FLORIDA**



LIT

OS

ITY

OP

LIT

LIT

LIT

OP

OP

TY

TY

TY

7

VO